

SEMIANNUAL STATUS REPORT
FOR THE PERIOD APRIL 1, 1965 TO SEPTEMBER 30, 1965
NASA RESEARCH GRANT NGR 05-007-065,
REDUCTION AND ANALYSIS OF MAGNETOMETER DATA FROM MARINER 4

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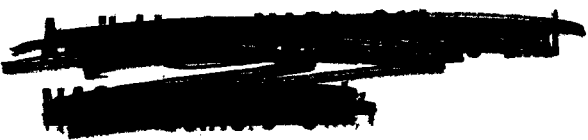
Purpose

The work supported under this grant is the reduction and analysis of the data obtained with the Mariner-4 magnetometer. The major part of this work is the reduction of the telemetered data, received from JPL on magnetic tapes, to a form which is useful in our analyses. We receive raw-data tapes arranged in two different formats. One format is called 'quick look'. Quick-look tapes contain only data that have been transmitted to JPL over the DSIF communications links. These quick-look tapes must be carefully edited and transcribed prior to the reduction of the raw magnetometer data. Tapes containing data in the other format are called 'experimenter extract tapes'. These tapes contain all of the data received by the DSIF from the spacecraft during a given interval. The extract tapes are much more carefully prepared so that considerably less effort is required in editing them.

Progress During the Reporting Period

Within a few months after the launching of Mariner 4, we began receiving quick-look tapes. During the reporting period, we completed the editing of all quick-look tapes covering the period through the encounter with Mars. Several steps in the analysis of the data from these quick-look tapes were completed also.

From these data, distribution densities of the various parameters pertaining to the field were taken over 27-day periods. From the means of these distributions, the gross properties of the interplanetary field during the flight were established. On the average, the field tends to lie roughly in the expected spiral direction, but the distribution of polarities along this direction is found to change from one 27-day period to the next. The polarity distributions obtained during the flight of Mariner 4 were then compared with those obtained during the flights of Mariner 2 and IMP 1. This comparison suggests that changes in the polarity of the interplanetary field occur much more often near the minimum of solar activity. The comparison of the data from these three flights also indicates that the strength of the interplanetary magnetic field decreases as solar activity decreases. Also, the tendency, observed previously with the Mariner-2 and IMP magnetometers, for the interplanetary field to have a southward component persists.



In addition, we have obtained rough estimates of the power spectra of the variations in the field during the flight of Mariner 4.

In studying the radial dependence of the field, we have found that the spiral configuration appears to predominate in the region between the orbits of earth and Mars. The intensity of the field, as expected, falls off with increasing heliocentric range. The amplitudes of the variations in the field exhibit similar dependences upon heliocentric range.

We have also received some extract tapes. During the reporting period, only those extract tapes covering approximately the first few weeks of the flight were available. However, data contained on these tapes were employed in an analysis of the measurements obtained when the spacecraft traversed the magnetosphere and the interaction region between the magnetosphere and interplanetary space. Very abrupt changes in the stability of the field were observed at the position of the earth's bow shock. There were at least seven traversals of the shock between 36.6 and 38.6 earth radii in a region approximately 105° , on the dawn side, from the earth's sun line.

The magnetometer data obtained at the time of the closest approach of Mariner 4 to Mars, on July 14 and 15, have been examined also. No magnetic effect that could be definitely associated with the planet was evident in the data. This observation implies that the Martian magnetic dipole moment is, at most, $3 \cdot 10^{-4}$ times that of the earth.

Expenditures

April 1, 1965 to September 30, 1965

General Assistance	\$ 8,822
Supplies and Expenses	
Computer Time - 60 hours @ \$207	12,420
Instrumentation Tape	415
Miscellaneous Supplies	342
Employee Benefits	
(10% of General Assistance, excluding students)	<u>882</u>
Total Less Overhead	\$22,881
University Overhead @ 39% of General Assistance	<u>3,441</u>
Total	\$26,332

Publications

The research discussed in the following papers was supported wholly or in part with funds from this grant:

Coleman, P. J., Jr., L. Davis, Jr., E. J. Smith, and D. E. Jones, Measurements of Magnetic Fields in the Vicinity of the Magnetosphere and in Interplanetary Space, Space Research VI, North Holland Publishing Company, Amsterdam, in press.

Smith, E. J., L. Davis, Jr., P. J. Coleman, Jr., and D. E. Jones, Magnetic Field Measurements Near Mars, Preliminary Report, Science, 149, No. 3689, 3241, 1965.

Coleman, P. J., Jr., L. Davis, Jr., E. J. Smith, and D. E. Jones, Variations in the Polarity Distribution of the Interplanetary Magnetic Field, December, 1965, (submitted to J. Geophys. Res.):